

1   **WHAT IS CLAIMED IS:**

2           1. A method for forming a cap without draft allowance comprising the steps as  
3 follow:

4           forming a metal mold constructed of a female portion, a male portion and a  
5 cylinder, an impression with a shape substantially equal to that of the cap and defined  
6 between the portions and the cylinder connected to one of the portions and  
7 communicated with the impression through an injecting passage, wherein each portion  
8 has a hardness in a range  $H_{RC}$  45 to 50, a heat treatment is applied to a surface of each  
9 portion to increase a hardness of the surface of the portion to  $H_{RC}$  70 with a depth 0.25  
10 mm and a smoothness of the surface of the half is  $800\mu$ ;

11           feeding molten material into the cylinder, wherein the molten material has a  
12 temperature between 650 and 680 °C ;

13           injecting the molten material into the impression, wherein the cylinder forces  
14 the molten material into the injecting passage at a low speed 1.5 m/s (meter per second)  
15 firstly, the molten material is then forced into the impression at a speed 4.5 m/s, and the  
16 cylinder provides a pressure about 220kg/ cm<sup>2</sup> to the molten material to increase the  
17 density of the molten material; and

18           cooling the molten material with cool water to solidify the molten material,  
19 wherein the molten material is cooled to between 180 and 200 °C in 20 to 25 seconds,  
20 and the molten material solidifies to a cap with a desired shape without draft allowance.

21           2. The method as claimed in claim 1 further comprising spraying an isolating  
22 agent onto an inner surface of the impression before the molten material is fed into the  
23 cylinder.

24           3. The method as claimed in claim 2, wherein the agent is a mix of 10% ester,

1 4% vegetable oil, 6% silicon oil, 1% polymer and 79% water; and

2 the agent is diluted with water at a ratio 1:120 when the agent is used.

3 4. The method as claimed in claim 1, wherein the mold has an air chamber

4 communicating with the impression; and

5 the air chamber is connected to an air pump to exhaust air from the impression

6 and the air chamber when the molten material is forced into the impression.

7 5. The method as claimed in claim 1, wherein each portion of the metal mold is

8 made of SKD 61 alloy tool steel.